SPRING 2003
VOLUME III; ISSUE 2

WE BELIEVE IN GROWING ALBERTA'S ECONOMY

the LINK

AARI
Alberta Agricultural Research Institute

AL.1.1717
c.2

Common Ground 1
The Funding Consortium is building relationships and research capacity in Alberta's agricultural industry.

New Projects 2
A list of new projects that have successfully received funding.

Renewals 4
A list of projects for which funding has been renewed.

Overcoming Challenges ... 6
Dr. Sheau-Fang Hwang's research into crop diseases is farmer-focused.

Board Profile 6
Art Froehlich's commitment to collaboration.

Fighting Fusarium 7
Research is an important part of the fight to keep Fusarium, the devastating cereal disease, from becoming a problem in the province.

Pioneers of Plastics 8
Biodegradable plant-sourced plastics may soon be grown and processed in Alberta.

Less Tillage, Big Benefits .. 10
Reducing soil tillage has far-reaching benefits, like preventing a Prairie dust bowl during the recent drought, and good research is the reason why farmers are successfully adopting this agronomic practice.

Continued on page 2

Common Ground

With mutual respect and a common goal, six agricultural funding groups have come together to build a better funding system for research and development projects in Alberta. The Funding Consortium has become the envy of its neighbours.

"One key (to the Funding Consortium) is respect of other funders' mandates," says Alan Hall, with AARI. "There is no lobbying, just a high regard and respect for decisions." He says that collaboration throughout the process has been important. "Being involved in the process from start to finish has built a culture of collaboration and respect." Hall adds that the system has caught the attention of other industries in Alberta, as well as national interest.

The process is very methodical and coordinated by Freda Molenkamp of AARI, who receives high praise for the energy and effort she brings to the group. "She's been key to this happening sooner rather than later," says Hall.

The process starts with the call for pre-proposals, sent out with a list of priority funding areas that the Consortium has jointly identified for the applicants. Each of the funding groups looks at the pre-proposals individually and then as a Consortium. About one third of the projects received make the short list, and successful applicants at this stage are asked to submit a full proposal, which may be subject to international review from leading world scientists. Then all proposals are rated according to a list of criteria, and short-listed again for the Boards of each funding group to choose which projects they want to fund.

The group approach to reviewing these proposals often leads to collaborative funding for projects. "For us, like with any other funder, you can't get this much out of any one organization," says Darcy Fitzgerald, General Manager of the Alberta Livestock Industry Development Fund, adding the Consortium allows funding groups to share the funds, as well as the workload.

That partnership has been most beneficial to groups with a smaller funding base, such as the Diversified Livestock Fund of Alberta (DLFOA). "We are early in our phase of development," says Bill Buchta, General Manager of DLFOA, "and don't have a lot of money to play with. We are more of a beneficiary of this system." Buchta says that with funding partners, they have been able to do critical research that would have been beyond their capacity to fund.

The Funding Consortium has been a learning venture for all of the groups involved, and many changes have been made along the way. One of the most significant changes is that the Consortium will now accept both Research and Development Applications. The members realized it was critical that the research continuum be captured among the funders, and this has now happened with this new addition. "Sometimes the research went on the shelf because it wasn't being developed. Now we see it right through from where someone had a bright idea to where the product hits the market."

The Funding Consortium is a prime example of collaboration working to further all participants, as well as Alberta's agricultural industry, and discussions with other funders are ongoing. Working together will go a long way to improving the Research and Development System in this province.

INSIDE Continued

For the Birds 11
From vitamin D to feather development, research is improving poultry health.

Making It Meaningful 12
Technology transfer is all about improving the relevance of lab research.

On the Way to Market 13
CV Technologies Inc. has taken Cold-FX, a natural approach to fighting the common cold, from research labs to medicine cabinets.

Strength in Numbers 14
With AARI's support, a network of key players is working in collaboration to understand conjugated linoleic acid (CLA), including its possible impact on human health.

Responsive Research 15
The University of Alberta and the Prairie Swine Centre are looking at air quality, odour, and swine housing.

Director's Column 16

New Project List

Highlights of a Few New Projects funded by the Funding Consortium

Improved Genetic Resistance to Mycosphaerella Blight of Field Pea.

Dr. Sheau-Fang Hwang, Alberta Research Council

Mycosphaerella is a fungus that causes severe damage in field pea crops, especially during ideal growing conditions. To alleviate this damage, tools are being developed to give breeders the means of producing substantially upgraded levels of resistance to the disease. These include identifying resistance in wild populations and germplasm lines, measuring the level and range of variability in pathogen populations, improving tissue culture techniques, and investigating the dynamics of the infection process.

Economic and Welfare Comparison of Three Different Group Housing Systems for Gestating Sows and Gilts.

Mr. John Church, Alberta Agriculture, Food and Rural Development

In Alberta, there is demand for information regarding alternative housing systems for sows as group housing becomes increasingly important in North America. A new study has recently been initiated by a team of researchers led by Mr. John Church of Alberta Agriculture, Food and Rural Development (AAFRD), which will investigate three viable gestation options that will potentially enable both sows and gilts to be loosely housed.

Key to New Project Funders

AARI = Alberta Agricultural Research Institute
ACIDF = Alberta Crop Industry Development Fund
ALIDF = Alberta Livestock Industry Development Fund
DLFOA = Diversified Livestock Fund of Alberta
AGFC = Agriculture and Food Council - CARD Program
AVAC = AVAC Ltd.

Proposal Title	Team Leader	Organization	Total Project Cost	Recommended Amount	Funders
Identification of Early Indicators of Metabolic and Reproductive Dysfunction from Over-Feeding Female Broiler Breeders	Dr. Frank Robinson	U of Alberta	$341,972	$98,072 over 2 years	AARI, ALIDF
Improved Genetic Resistance to Mycosphaerella Blight of Field Pea	Dr. Sheau-Fang Hwang	Alberta Research Council	$1,566,000	$370,000 over 4 years	AARI, ACIDF
Development of Neonatal Immunization Strategies Against Bovine Respiratory Disease Using CpG Motifs as Adjuvants	Dr. Sylvia van Drunen Little-van den Hurk	Vaccine and Infectious Disease Organization	$398,365	$208,265 over 3 years	AARI, ALIDF
Vaccination Strategies to Enhance Immunity in the Bovine Mammary Gland	Dr. Andrew Potter	Vaccine and Infectious Disease Organization	$404,919.60	$205,169 over 3 years	AARI, ALIDF
Factors Affecting the Microbiological Condition of the Deep Tissues of Mechanically Tenderized Beef	Dr. Colin Gill	Agriculture & Agri-Food Canada	$115,614	$65,144 over 1 year	ALIDF
Breeder Flock Age and Vitamin D Effects on Broiler Hatchability, Immune System and Bone Characteristics	Dr. Doug Korver	U of Alberta	$310,671.50	$101,541.50 over 2 years	ALIDF, AGFC
Economic and Welfare Comparison of Three Different Group Housing Systems for Gestating Sows and Gilts	Mr. John Church	Alberta Agriculture, Food & Rural Development	$390,118	$175,318 over 2 years	AARI, ALIDF
Rapid Determination of Broiler Amino Acid Requirements and Amino Acid and Energy Availability of Feedstuffs	Dr. Doug Korver	U of Alberta	$538,847.56	$203,605.23 over 2 years	AARI, AGFC

Development of a Biological Intervention Strategy to Reduce Carriage of the Foodborne Pathogen *Escherichia coli* 0157: H7 in Cattle	Dr. Erasmus Okine	U of Alberta	$466,629	$189,252 over 3 years	AARI, ALIDF, AGFC
Significance and Pathogenesis of AIDA-1 *E. coli* Infection in Pigs	Dr. Dorothy Middleton	Western College of Veterinary Medicine	$238,880	$75,000 over 3 years	ALIDF
Irrigation Management of Black Currants and Saskatoons	Mr. Gregg Dill	Agriculture & Agri-Food Canada	$261,175	$50,000 over 2 years	ACIDF
Commercial Supercritical Fluid Extraction of Canola to Produce Higher Valued Oil and Meal	Dr. Feral Temelli	U of Alberta	$328,600	$210,000 over 3 years	AARI, AVAC, ACIDF
Conventional and Chemical Free Control of Potato Late Blight and Colorado Potato Beetle	Dr. Qin Chen	U of Alberta	$1,375,000	$375,000 over 3 years	AARI, ACIDF
Rosemary Nutraceutical Industry Feasibility Study	Dr. Mohyuddin Mirza	Alberta Agriculture, Food & Rural Development	$244,900	$64,900 over 2 years	AVAC, ACIDF
FHB Mycotoxin Detoxification and Increased Resistance to Initial Infection in Wheat and Barley	Dr. Francois Eudes	Agriculture & Agri-Food Canada	$1,933,280	$423,280 over 5 years	AARI, ACIDF
Disease Resistance in *Brassica napus* Canola: Proteomics-Based Investigation	Dr. Nat Kav	U of Alberta	$1,648,200	$365,700 over 3 years	AARI, ACIDF
A *X-tritosecale* Platform for the Production of Proteins Biopolymer	Dr. Dennis Gaudet	Agriculture & Agri-Food Canada	$2,545,000	$995,000 over 4 years	AARI, AVAC, ACIDF
Improved Management of Root and Stem Rot Diseases in Greenhouse Cucumber	Dr. Ron Howard	Alberta Agriculture, Food & Rural Development	$430,500	$150,000 over 3 years	ACIDF, AGFC
Improved Oat Varieties for Noodles and Pasta in Alberta	Dr. Solomon Kibite	Agriculture & Agri-Food Canada	$380,000	$185,000 over 3 years	AARI, ACIDF
Barley Resistance to FHB	Dr. Kequan Xi	Alberta Agriculture, Food & Rural Development	$795,000	$270,000 over 3 years	AARI, ACIDF
Evaluation of the Use of Beta-Glucan Depleted Barley/Oat Flour as Animal Feed	Dr. Thava Vasanthan	U of Alberta	$692,400	$258,750 over 3 years	AGFC, AVAC, ACIDF
Development of Prebiotics, Probiotics and Synbiotics Containing Functional Foods for the Management of Inflammatory Bowel Diseases	Dr. Lech Ozimek	U of Alberta	$1,130,352	$448,500 over 3 years	AARI, AGFC, AVAC
The Effect of Irrigation and Nutrient Management on Yield and Quality of Timothy Hay	Mr. Gregg Dill	Alberta Agriculture, Food & Rural Development	$760,950	$150,000 over 4 years	AGFC, ACIDF
Characterization and Integrated Cultural and Chemical Control of Ascochyta Blight of Chickpea	Dr. Kan-Fa Chang	Alberta Agriculture, Food & Rural Development	$561,000	$180,000 over 3 years	AARI, ACIDF, AGFC
Non Invasive Early Detection of Disease in Livestock: Improving Animal Welfare and Reducing Antibiotic Use	Dr. Al Schaefer	Agriculture & Agri-Food Canada	$502,500	$155,250 over 3 years	ALIDF
Monocots Transgenesis Via Single-Stranded T-DNA Complex Delivery to Pollen	Dr. Igor Kovalchuk	U of Lethbridge	$630,000	$350,000 over 4 years	AARI
Evaluation of Annual Legumes as Potential Seed Crops in Alberta	Mr. Henry Najda	Alberta Agriculture, Food & Rural Development	$167,500	$90,000 over 3 years	ACIDF
The Importance of Beta-Glucan to Immune Development in the Weaned Piglet	Dr. Catherine Field	U of Alberta	$252,101	$77,956 over 2 years	AGFC, AVAC
Disease Fighting Nutraceuticals from Stress Induced Native Plants	Dr. Kevin Smith	U of Lethbridge	$464,000	$320,000 over 4 years	AARI, AVAC
Cost-Effective Feeding of Farmed Deer	Dr. Bob Hudson	U of Alberta	$197,640	$105,340 over 2 years	AARI, DLFOA
Assessing the Consumer Acceptance and Market Potential of Alternative Meats	Dr. Kevin Chen	U of Alberta	$130,694	$39,694 over 2 years	AARI, DLFOA, AGFC
				Total Funding $2,726,472.23 (AARI) $1,930,480 (ACIDF) $739,578.50 (ALIDF) $25,000 (DLFOA) $698,978 (AGFC) $835,228 (AVAC)	

Renewal Project List

Proposal Title	Team Leader	Location	Maximum Recommended Amount 2003/2004
Economic Impact and Management of Leaf Spot Diseases on Forage and Seed Alfalfa	Dr. Sheau-Fang Hwang	Alberta Research Council	$23,000
Use of Near Infra Red Reflectance Spectroscopy	Dr. Erasmus Okine	U of Alberta	$26,378
Integrated Management of Cabbage Weevil in Canola	Dr. Lloyd Dosdall	Alberta Agriculture, Food & Rural Development	$288,000
Risk Perceptions, Social Interactions and the Influence of Information on Social Attitudes to Agricultural Biotechnology	Dr. Michele Veeman	U of Alberta	$45,425
Non-Traditional High Quality Forage Crops with Distinct Advantages for Livestock Production	Dr. Surya N. Acharya	Agriculture & Agri-Food Canada	$145,560
Gametophyte Screening for Trichothecene Resistance in Soft White Spring and Winter Wheat	Dr. Robert Graf	Agriculture & Agri-Food Canada	$119,201
Novel Enzymes of Ruminal Origin to Improve Fibre for Feed and Industrial Processes	Dr. Doug Inglis	Agriculture & Agri-Food Canada	$70,000
Irrigated Cropping Systems for Sustainable Management	Dr. Frank Larney	Agriculture & Agri-Food Canada	$82,345
Reducing the Impact of *Fusarium graminearum* on Alberta's Cereal Value Chain	Dr. Kelly Turkington	Agriculture & Agri-Food Canada	$215,905
Growth of *Escherichia coli* at Chiller Temperatures	Dr. Colin O. Gill	Agriculture & Agri-Food Canada	$57,220
Fractionation of Alberta Grains Using a Novel/New Patented Technology for Food and Non-Food Industrial Applications	Dr. Thava Vasanthan	U of Alberta	$46,000
Improving Agronomic Traits for Legumes and Creating Value-Added Legume Products	Dr. Jocelyn Ozga	U of Alberta	$194,166
Systems Engineering for Handling and Land Application of Solid and Semi-solid Livestock Manure	Dr. Claude Lague	U of Saskatchewan	$36,470
Using Proteomics to Establish an Extracellular Plant Proteins Database (EPPdb) in *Brassica napus* (Canola)	Dr. Gregory Taylor	U of Alberta	$84,617
Biotechnology for Increasing Seed Oil Content in Canola	Dr. Randall Weselake	U of Lethbridge	$99,997
Barley-Based Functional Foods/ Nutraceuticals and Their Health Benefits	Dr. Feral Temelli	U of Alberta	$71,025
Chickpea and Lentil Cultivar Development for Alberta	Dr. Tom Warkentin	U of Saskatchewan	$48,235
Assessment of the Fate of Nitrogen Fertilizer Using Isotope Techniques	Dr. Bernhard Mayer	U of Calgary	$11,282
A Bioeconomic Model of the Broiler Chicken Supply Chain	Dr. Martin Zuidhof	Alberta Agriculture, Food & Rural Development	$17,805
Integrated Control of Rhizoctonia Root Rot of Pulses (Pea, Lentil and Chickpea)	Dr. Sheau-Fang Hwang	Alberta Research Council	$132,100
Map-Based Cloning of a *Brassica napus* Gene Conferring Resistance to the Blackleg Fungus	Dr. Allen Good	U of Alberta	$131,675
			Total: $1,946,406

Highlights of a Few Renewed Projects

Growth of *Escherichia Coli* at Chiller Temperatures.

Dr. Colin O. Gill, Agriculture and Agri-Food Canada

The temperatures of raw foods such as meat must be well controlled to assure the safety and storage stability of the products. At present, optimal conditions are identified on the assumption that mesophilic pathogens like *E. coli* O157:H7 do not grow at temperatures below 7°C, however, some research indicates this is not true. Data needs to be collected to obtain basic, scientific knowledge about the ability of *E. coli* and related pathogens to respond to temperature stresses that are commonly encountered in the production and distribution of meat; and to redefine the optimum conditions for storing chilled meat and other foods. The behaviour of cold-adapted, log phase *E. coli* at temperatures above and below the minimum for sustained growth has been examined in detail. A scientific paper, "The behaviour of log phase *Escherichia coli* at temperatures below the minimum for sustained growth" has been published. A scientific paper, "Behaviour of log phase *Escherichia coli* at temperatures near the minimum for growth" has been submitted for publication. During the current year, *E. coli* will be cultivated at fluctuating temperatures to obtain data from which to construct empirical models that describe growth under such conditions.

Biotechnology for Increasing Seed Oil Content in Canola.

Dr. Randall J. Weselake, University of Lethbridge

Increasing oil content per seed and plant is a major objective of oilseed crop commodity groups. The study proposes to increase the seed oil content of canola using native and slightly modified diacylglycerol acyltransferase (DGAT), a key enzyme that drives the final step in oil accumulation. In the original objectives, the overall goal of this project is to develop canola germplasm with increased oil formation capacity by over-expressing cDNA encoding DGAT, or a modified form of the enzyme, during seed development. Most aspects of the Action Plan outlined in the renewal application for 2002-2003 have been fulfilled to date. However, working with two forms of DGAT amounted to a great deal of work. Subsequently, we have decided to focus only on over-expression of BnDGAT1. *Brassica napus* L. cv Westar will continue to be transformed with cDNA encoding DGAT. First Generation and T2 Seeds will be evaluated.

Barley-based Functional Foods/Nutraceuticals and Their Health Benefits. **Dr. Feral Temelli, University of Alberta**

Barley-derived beta-glucan and tocols (tocopherols and tocotrienols, the vitamin E family of eight compounds with antioxidant activity found in barley oil) are known to have positive effects on blood cholesterol profiles, but the processing variables and the subsequent fractions which produce and contain the most physiological activity are not well defined. This information will be critical for product development targeted at individuals at risk for cardiovascular disease. The long-term goal of the study is to enhance use of barley in the human diet based on demonstrated health benefits. Significant progress has been made over the past year towards reaching the goals set out for this project. Our results in the intestinal cell line suggest that genes involved in fat synthesis and their transcription factors are significantly down-regulated by high-viscosity fractions of oat and barley.

Integrated Management of Cabbage Seedpod Weevil in Canola. **Dr. Lloyd Dosdall, University of Alberta**

The cabbage seedpod weevil poses a grave threat to the profitable production of canola in Western Canada, and the only control strategy now available to producers is application broad-spectrum chemical insecticide. Among the key objectives of the project are to identify sources of resistance to cabbage seedpod weevil in species of *Brassicacea* and to develop new canola varieties resistant to attack. The key results expected from the project are improved profitability of the Canadian canola industry and enhanced environmental sustainability. Although many samples remain to be processed in forthcoming months, it is clear that all results the study hoped to achieve in 2002-2003 have been met, or will soon be met; in fact, progress in several areas has exceeded expectations.

DID YOU KNOW...

In the past two years, the drought in Western Canada was more severe than the infamous dirty '30s, but thanks to reduced tillage of the soil, farmers prevented the dust storms and topsoil losses that made that era famous.

The colour of an eggshell is determined by the breed of the hen, and the colour of the yolk is determined by their feed.

One cell in a wheat plant has 10 times the amount of DNA found in a human cell.

Alberta is the largest beef producing province in Canada. The province leads the nation in cattle and calf inventories, accounting for 6.6 million head or 42 per cent of the national total as of the 2001 Census of Agriculture.

In 2001, Alberta accounted for 14.8 per cent ($570 million) of Canada's farm cash receipts from the sale of hogs.

Board Profile

Art Froehlich

Art Froehlich is so interested in the work of AARI that he has agreed to return to the Board of Directors after a few years absence. Froehlich has six years of previous service on the AARI Board to his credit, and has now served a year of his new term. His particular interest is in the Agricultural Funding Consortium, which reflects his strong commitment to the collaborative approach that underpins AARI activities.

Froehlich holds a degree in Agriculture from the University of Saskatchewan, enhanced by his studies in Executive Management at the Wharton School of Business, University of Pennsylvania. The breadth of his education is reflected in his career. Today he is a partner in AdFarm, an agricultural communications company, while, at the same time, he continues to manage a cow/calf operation and raise registered Angus cattle on a family farm.

As well, in several other roles that gave him many years of experience marketing Canadian agricultural products overseas, Froehlich gained an understanding of how other countries handle R&D. He notes that those with the most interaction between industry and scientists have the most success, and he carries that insight to his work with AARI. An advocate of innovation as the key to Canada's competitiveness, he also would like to see research develop answers to the questions emerging from the increasing scrutiny by the public and the industry itself. "I firmly believe that the challenges facing agriculture, now and in the future, can best be addressed through research," he says.

Overcoming Challenges

Researching crop diseases has long been a passion of Dr. Sheau-Fang Hwang, Senior Research Scientist at the Alberta Research Council. While research is her work, she hasn't forgotten who her work benefits – the farmers.

Dr. Sheau-Fang Hwan

Dr. Sheau-Fang Hwang has overcome many challenges to get to where she is today. Once content to remain a research assistant in Taiwan working on fusarium, today Hwang is an award-winning Senior Research Scientist in Canada. While working in Taiwan, she received an invitation to train at the University of Berkley in California, which she says "was the turning point of my life." Overcoming culture-shock and the challenge of learning English, Hwang earned her Ph.D. in Plant Pathology in 1983 from Washington State University. She currently works at the Alberta Research Council on the unique challenges forage and pulse diseases present in Alberta.

Her work is very producer-focused. "My job is very rewarding in so many ways," says Hwang. "When I publish a scientific paper, I'm very proud to be recognized by my peers. Yet when I attend growers' meetings and talk to them and get them excited about the work we're doing – that's really rewarding."

Working with diseases in forage crops is particularly rewarding in a province that has the largest beef herd in Canada. To maintain the supply of forage crops to feed that herd, work needed to be done to protect Alberta forage stands which are sometimes difficult to establish because of soil-borne diseases. Her work focused on preventing crown and root diseases of forages either through seed treatment, timing of seeding, or appropriate choice of variety.

She believes her work has made forage production more profitable. "Seed treatment has become more widespread for forage crops," says Hwang. "The research has pointed out mistakes to be avoided (such as late seeding) and has shown some types of grass and some varieties of alfalfa to be more suitable than others, especially in areas susceptible to snow mould."

When farmers began to diversify into other crops because of low prices in cereals, Hwang also began working with field peas, lentils, and chickpeas to manage both root rot diseases and foliar diseases. Together with her team leading the way in conducting efficacy tests on various seed treatments for root rot, new fungicides have been registered for these crops. They also conducted efficacy trials on several spray treatments for foliar diseases, and determined that these diseases are very weather-dependent. As a result, she helped build a system to forecast when the diseases are likely to develop and when treatments need to be applied.

Hwang says the expansion of pulse crops in the last decade has opened up options for producers. "This has given farmers an alternative crop of high value to stabilize their incomes. And pulse crops, when added to a crop rotation sequence, are also very beneficial to the soil. I believe that pulse crops have further potential for increased production in Alberta when the problems associated with foliar diseases are solved."

While her upcoming work, partly funded by AARI, will be focused on control of rhizoctonia seedling blight, mycosphaerella blight, and powdery mildew in peas, Hwang hasn't forgotten the number one reason her work exists – farmers. She conducts plot tours for producers to take a look at current research. "Plot tours allow farmers to see the current research, but more importantly, they provide an ideal setting for farmers and researchers to rub shoulders," says Hwang. "This leads to a better understanding of problems faced by the farmers, so that researchers can design experiments to solve these problems." A notable goal for a woman who always has her eye on farmers' needs.

Fighting Fusarium

Currently, Alberta has low levels of fusarium head blight (FHB) caused by *Fusarium graminearum*, but that's only thanks to the extraordinary, province-wide efforts of the agricultural industry. The research that supports those efforts guides the industry on how to manage and avoid this devastating disease, and AARI and others are contributing to a number of ongoing research projects that will keep Alberta crops healthy and its grain clean.

PHOTO COURTESY CANADIAN GRAIN COMMISSION

FHB, caused by the fungus *Fusarium graminearum*, is a growing concern in Alberta, as producers here witness the devastation it causes in the Eastern Prairies, and do their utmost to prevent the same problems in the West. The disease thrives in a moist environment, and not only robs cereal producers of yield, but damages grain quality. Perhaps the most significant quality damage is grain contamination with a toxin, specifically a mycotoxin called deoxynivalenol (DON), that limits human and livestock uses for the grain.

> "Developing a better understanding of this pathogen and disease in Alberta will lead to strategies that help to reduce its potential to cause problems for producers."
>
> Dr. Kelly Turkington

There are a number of research projects that AARI is helping to fund and that are taking a proactive approach to fusarium management. Dr. Kelly Turkington, plant pathologist with Agriculture and Agri-Food Canada's Research Centre in Lacombe, Alberta, is using AARI funding to study a number of aspects of *Fusarium graminearum*, including the current state of the disease in the province. "There was a lack of knowledge as to how common this pathogen is in Alberta," says Turkington, "so one objective was to establish a baseline including both symptoms in fields caused by this pathogen and its presence in crop and grass residues. Developing a better understanding of this pathogen and disease in Alberta will lead to strategies that help to reduce its potential to cause problems for producers."

Once a baseline is established, there are many aspects of the pathogen and disease that must be understood in order to manage it. Among the projects that Turkington is working on are:

- identifying factors related to the development, appearance, and spread of *Fusarium graminearum* in Alberta, and the areas in Alberta that are at highest risk
- researching the potential of treating seed with heat to kill the pathogen but retain seed quality
- investigating how irrigation management can reduce the risk of disease
- determining the potential economic impact if *Fusarium graminearum* becomes established in Alberta, and the economic benefits, should it not become well established
- ensuring technology transfer to create awareness of the issue and a flow of information from researchers to producers in the province.

Dr. Francois Eudes, a biotechnologist with the Lethbridge Research Centre, begins a new project this April using AARI funding to create wheat varieties with greater and different methods of resistance to *Fusarium graminearum*. "The aim of the project is to target specific resistance to disease related to mycotoxins produced and the plant's ability to degrade and tolerate toxins."

Eudes is crossing 16 internationally sourced, resistant wheat lines with varieties from major classes of Western Canadian wheat. He is using the mycotoxin itself to identify resistant young plants in the early stages, selecting only the embryos that can grow in the presence of the toxin, and then identifying the type of resistance within the plants. "The ability of plants to break down the toxin is very interesting," says Eudes, "because it may mean a crop can destroy any toxins that are produced from a fusarium infection, and actually rid itself of the contaminant, a valuable feature for avoiding contaminated feed and food grains."

Also contributing to fusarium research are cereal pathologist Dr. Kequan Xi, molecular biologist Dr. Jennifer Zantinge, and plant breeder Dr. Jim Helm – a team of researchers with Alberta Agriculture, Food and Rural Development in Lacombe. They are working on faster methods to identify fusarium resistance in new barley varieties. "This is a new approach for barley," says Helm. "We have come up with the idea to screen for genetics in resistant or tolerant barley lines in the lab." He says this approach will ensure the pathogen won't get into Alberta as the result of testing for fusarium resistant lines – testing that naturally requires that fusarium infect the crops so its resistance can be measured. This also avoids having to send plant material to other countries where fusarium is prevalent in order to evaluate their resistance levels, as was the common practice in Alberta because fusarium levels are so low.

A common goal of all these researchers is to prevent fusarium from establishing in Alberta with devastating results. "We want to put fusarium resistance into the plants so fusarium doesn't come here," says Helm. "That's part of the Alberta fusarium policy. If we can come up with resistance before it gets here, we'll avoid the kind of damage that Manitoba and Saskatchewan are experiencing." That damage is estimated at between one to several hundred million dollars per year. These projects are the kind of proactive work that AARI and other funders in the Agricultural Funding Consortium take pride in supporting.

Dr. Suresh Narine

Pioneers of Plastics

The world consumes about 140 million tons of plastic every year. If you knew there was a way to make more biodegradable, renewable-source plastics for our everyday uses, at the same cost as petroleum-derived plastics, would you buy them? Chances are you would, and they may soon come to a shelf near you with a "Made in Alberta" stamp.

Dr. Suresh Narine brings a unique perspective to agricultural research. With a background in physics, he applies physical science to agriculture in ways that are bringing new possibilities to Alberta. Among the projects he is working on as an Associate Professor at the University of Alberta is "Biodegradable Polymers from Alberta Oilseeds: The Fundamental Science, Pilot Scale Development, Economic Feasibility and Market Analysis."

While the title is long, the overall objectives are clear: to create a scientifically, economically, and commercially viable source of biodegradable polymers in Alberta, using the renewable resources of canola and flax. The benefits to Alberta are also clear, and extensive:

- broaden the access of Alberta farmers to the new lucrative markets, boosting canola and flax production and prices in the process
- create a new value-added market for Alberta's oilseed crops
- increase the number of highly trained personnel in Alberta who are capable of providing the high-level skills that will be necessary from technical, industrial, and business perspectives to fuel the new growth sector
- increase Alberta's ability to attract research and skilled personnel from around the world
- increase Alberta's ability to attract and retain large processing companies
- ensure that Alberta becomes the world-leader in the production of biodegradable polymers from renewable agricultural oilseeds
- significantly lower the strain on landfills, and remove the need to recycle as it has significant energy costs
- relax the immense demand on Alberta's ever diminishing fossil fuel resources
- reduce energy requirements for production of plastics
- spawn a new manufacturing industry, which means job creation and wealth gathering by the province through business taxes
- allow Alberta to own and control the ability to produce bio-polymers from their oilseeds, through careful intellectual property management
- create a symbiotic relationship between Alberta's two key economic sectors – energy and agriculture.

> "The uses are as varied as the uses for currently produced plastics, depending on the type of agricultural plastics being produced."
> Dr. Suresh Narine
> Associate Professor, University of Alberta

The potential savings in fossil fuels is tremendous, should this project succeed. Narine says that it takes approximately 150 million tons of fossil fuels to make the 140 million tons of plastics the world consumes every year. Saving this amount of fossil fuel use is staggering, especially considering this is just the fuel being used for primary processing of the plastic, and does not include the millions of tons of fossil fuel that Narine says are used to further process the plastic into the familiar toys, carpets, house siding, insulation, car panels, and other products we use every day.

The possibilities for using these plant-derived polymers are just as endless as current uses. "The uses are as varied as the uses for currently produced plastics, depending on the type of agricultural plastics being produced," says Narine. "For example, the PLA (polylactic acid) being produced by Dow-Cargill is used in a variety of applications. There are a number of agricultural plastics being used in the food packaging industry as well. And lately, a tremendous amount of composites have hit the market, for example, composites of agricultural fibres with traditional plastics to make things like deck planking. As the technologies develop and improve to convert agricultural commodities to plastics, the uses will expand and broaden."

While the project shows significant potential for expanding options and benefits in Alberta's agricultural industry in the future, it has already created one new venture in Alberta. The Alberta Bioplastics Network (ABN) was formed around this project and, according to Narine, will continue to develop other links to value-added opportunities as they materialize.

"The ABN is a multi-institutional research network whose mandate is to engage in activities to promote the use of Alberta's agricultural commodities as feedstock for the production of specialty chemicals and polymers," says Narine, who currently serves as the Director of the ABN. He adds that the Network involves a number of partners: The University of Alberta (Departments of Agriculture, Food and Nutritional Science, and Chemical and Materials Engineering); the Alberta Research Council; Alberta Economic Development; Alberta Agriculture, Food and Rural Development; Environment Canada; Agriculture and Agri-Food Canada; Alberta Canola Producers Commission; and Toma and Bouma Management Consultants.

Funding for the project comes from a number of sources, including AARI, the Agriculture and Food Council, the Alberta Crop Industry Development Fund, AVAC Ltd., National Sciences and Engineering Research Council of Canada and the Alberta Canola Producers Commission.

Narine describes the project as being conducted in four broad areas. "There is a fundamental science team, developing the processes and plastics at the laboratory scale," he says. "The fundamental science team is led by myself, and includes Dr. Peter Sporns (Agriculture, Food and Nutritional Science, University of Alberta) and Dr. Phillip Choi (Chemical and Materials Engineering, University of Alberta)."

Unbelievable Background

"I guess my background can be considered unique because I am a materials physicist by training. However, I work with food and agricultural materials," says Narine. Raised in Guyana, but educated in Canada, his degrees include a B.Sc. in physics and chemistry, a M.Sc. in chemical and material physics, and a Ph.D. in food science.

After completing his degrees, Narine fulfilled the dream of chocolate lovers everywhere, working for M&M Mars in Pennsylvania. However, when offered a position with the University of Alberta two years ago, Narine and his family took the opportunity to return to Canada.

Since that time, Narine has developed a state of the art facility at the University of Alberta called the Agri-Food Materials Science Centre, where he applies his unique talents. "I do believe that I am the only physicist working in this area in Canada," Narine says.

Secondly, "There is a scale-up team, led by Connie Phillips of the Centre for Agri-Industrial Technology (CAIT), which involves Donna Day and staff of the Alberta Research Council, and staff at CAIT," says Narine.

> "If the project continues to be promising, it is expected that it will be commercialized soon, and will continue beyond 2005, due to additional developmental activities being required."
>
> Dr. Suresh Narine
> Associate Professor, University of Alberta

Thirdly, he says there is a marketing and investment group, led by Ed Phillipchuk of Alberta Agriculture, Food and Rural Development, and involving Ed Condrotte of Alberta Economic Development, Donna Day from the Alberta Research Council, Ward Toma from the Alberta Canola Producers Commission, Brenda McIntyre from Agriculture and Agri-Food Canada, and Jerry Bouma from Toma and Bouma Management Consultants.

Finally, Narine adds there is a policy, regulations, and biodegradability fate analysis and environment impact team, led by Narine Gurprasad from Environment Canada.

"The project is currently funded over a three-year period, and began in 2002," says Narine. "If the project continues to be promising, it is expected that it will be commercialized soon, and will continue beyond 2005, due to additional developmental activities being required."

While the project shows promise, there is at least one crucial factor that will have to be met before biodegradable, renewable-source polymers hit the market. "This technology MUST compete with traditional processes in terms of cost and in terms of functionality of the final product," Narine emphasizes. "Many plastics from agricultural sources do not compete very well on these points. Our market studies have indicated that just because plastics may be more environmentally friendly, in terms of being less energy intensive to produce, having less of an environmental footprint because of being biodegradable, and being produced from a renewable resource, as our plastics are, customers will not pay more for them. Nor will they tolerate sub-standard performance, such as garbage bags that disintegrate in the rain. Therefore, our plastics will have to compete from a price and functionality perspective as well."

Projects like this one, with far-reaching opportunities and benefits that touch more than just Alberta's agriculture industry, are the kind of research that Alberta needs to reach its industry goals. Narine and other scientists are the new pioneers, reaching further with science than has ever been done before – right here in Alberta.

Less Tillage, Big Benefits

You may not realize it, but reduced tillage benefits everyone in Alberta, from farmers to city folk, and even contributes to improving the state of worldwide issues like greenhouse gases and global warming. Peter Gamache helps to enlighten on how decades of research have translated to benefits that everyone enjoys.

As Team Leader of Alberta Reduced Tillage Linkages, Peter Gamache is aware of numerous research projects seeking to improve the understanding and application of reduced tillage. AARI has contributed funding to a number of projects over the past 20 years focused on the same goal, and this work has resulted in significant accomplishments.

Gamache says that one of the earliest contributors to reduced tillage and direct seeding (seeding with little or no disturbance of the soil) is Dr. Wayne Lindwall of Agriculture and Agri-Food Canada's Semiarid Prairie Agricultural Research Centre. His early research, some of which was funded by AARI, pioneered the concept of reducing tillage, and inspired a handful of farmers to adopt the practices on their own farms, getting the ball rolling for a practice that has rapidly become commonplace.

Already, the number of acres committed to reduced or zero tillage in Alberta are nearly double that of conventional or multi-pass tillage. According to Statistics-Canada, in 2001, 6.55 million acres in the province were managed with reduced tillage and 5.07 million acres were managed with zero tillage, while 6.85 million acres were managed with multi-pass tillage.

The benefits of tillage reduction include those that farmers enjoy directly. One of the most significant benefits is improved moisture retention and management. "A lot of that is coming to the fore with the current drought pattern," Gamache says. "That's why you see a lot of stubble around. Zero tillage is one of the best ways we know to make the best use of the moisture we get."

Gamache says one overall key advantage for farmers is an economic one. "While there are significant capital costs up front," he says, referring to the different equipment required for direct seeding and other management in zero tillage, "there is a significant reduction in time." Gamache says some farmers have cut their tractor hours in half, reducing wear and tear on equipment, cutting fuel costs for field management and, in some cases, allowing farmers to work more acres to spread out their capital costs and become more profitable. It has even allowed some farmers to grow winter cereal crops where they couldn't before, thanks to the protection and moisture retention provided by crop stubble.

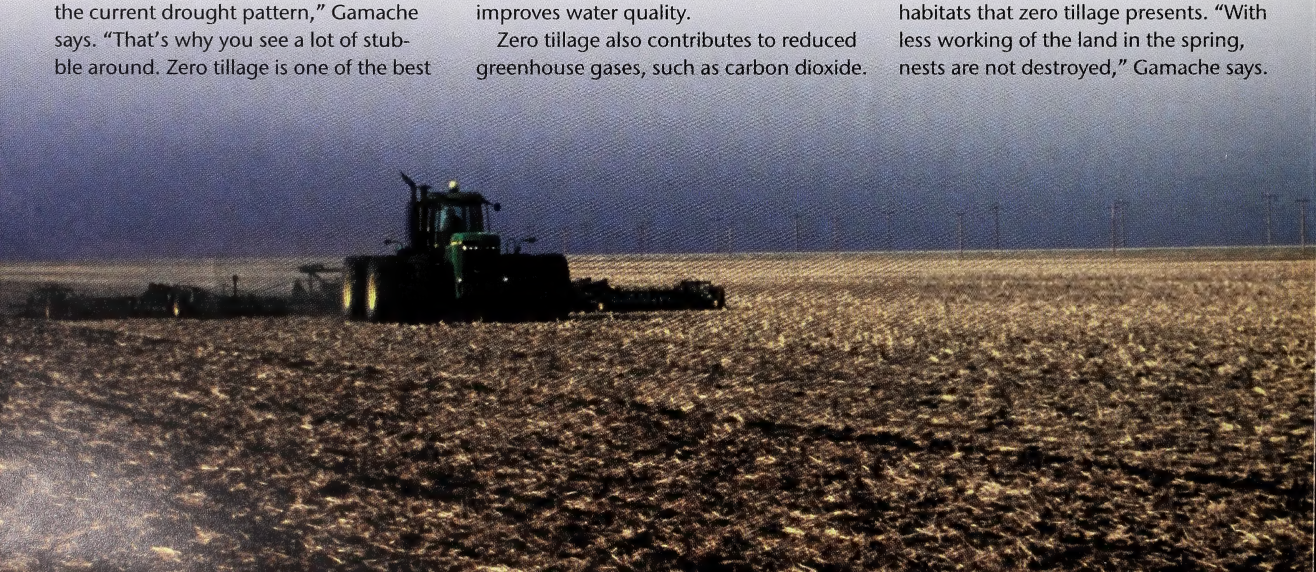
Some unexpected benefits also occurred, including improved soil health. The soil structure was improved, water drained more efficiently in areas where it used to pool, and more earthworms and soil microbes were available to keep the soil healthy.

The numerous benefits of zero tillage also extend beyond farmers to benefit all of Alberta. Gamache says that air quality is improved with the reduction in blowing soil. This benefit is more obvious when we consider that the drought in the past two years in Alberta was worse than the infamous dirty '30s, and yet there were few dust storms to speak of. Gamache adds that less dust blowing around also improves water quality.

Zero tillage also contributes to reduced greenhouse gases, such as carbon dioxide. All plants take in carbon dioxide and release oxygen. Not disturbing the soil with tillage results in sequestration of carbon reducing the amount in the atmosphere, since tillage actually releases plant-stored carbon back into the air. Reduced and zero tillage also involves more efficient fertilizer use, which reduces the amount of nitrous oxide, a potent greenhouse gas, that is released in the air.

"There has been quite a bit of work done in the area of fertilizer," says Gamache, "especially how we can apply fertilizer and how much we can apply with the seed." This research is critical to reduced tillage systems, but has also benefited other farming systems by demonstrating the most efficient means of applying fertilizer.

There are even more direct benefits for wildlife. Gamache says Reduced Tillage Linkages is working with Ducks Unlimited's winter cereals program because of the improvement of nesting habitats that zero tillage presents. "With less working of the land in the spring, nests are not destroyed," Gamache says.



The successful adoption of reduced tillage was made possible through research projects that examined the best means of applying all management techniques in a reduced or zero tillage system. Farmers had to relearn how to manage their crops in a different system.

"Parallel with that is the whole weed control issue," Gamache adds. "We started to learn about that with changes in practices from multi-pass tillage operations to one-pass seeding." As the type of weeds that grew in the field changed, farmers had to learn how to manage them. That need led to research in different areas, like how to improve the competitiveness of crops using row spacing and seeding rates – techniques that are helping all farmers reduce their need for chemical or tillage control of weeds.

"Part of what we learned in direct seeding or zero tillage is that we had to think more about crop rotation," Gamache says. "That has had benefits for improving diversity, increasing marketing options, and improving weed control and herbicide resistance management."

The study and adoption of reduced and zero tillage have led to a better understanding of how crops and soils function together, and have resulted in benefits that impact all our lives on some level. In particular, it has helped the agriculture industry in Alberta rise to new heights of understanding, productivity, and quality in crop production. And everyone has enjoyed the benefits of cleaner air.

For the Birds

Can something as simple as feathers help solve animal welfare issues? What if daylight and vitamin D could help laying hens build stronger bones? AARI-funded poultry research at the University of Alberta is exploring unique options for eliminating current welfare hurdles in the industry.

Public scrutiny regarding animal health and welfare is a constant in the livestock industry, and the poultry sector is no exception. Dr. Doug Korver and Dr. Frank Robinson, poultry specialists at the University of Alberta, are heading-up several timely projects that provide answers for better production and animal welfare combined.

Each project addresses a particular concern within the industry and involves several sources of funding. Robinson is quick to point out AARI's invaluable support, "We really can't stress enough how important AARI is for our research."

Strong Bones

Osteoporosis occurring in laying hens is a serious metabolic disease concern within the chicken egg laying industry, both for production and welfare. Hens continually mine their bones of calcium while producing eggs, sometimes resulting in brittle bones that break easily near the end of the hen's production, or hens stopping production prematurely. This project blends the effects of genotype, environment, and nutrition on delaying puberty in hens, so as to provide the hens with extra time to store calcium before beginning laying.

"We're at the analysis stage of this project, and we can conclude that by manipulating the photoperiod we can delay puberty by almost a week." The delay of an entire week doesn't sound like much, but in the long-term it could have significant positive affects on the layer industry. "Conversely, the effects of two different levels of vitamin D fed to the hens have been subtle, if they exist," explains Korver.

A Challenge of the Sexes

Fowl present a unique challenge early on in their production – it is quite difficult to tell whether a poult (young turkey) is male or female. Currently, it is commonplace to apply compressed air to a turkey poult's abdomen to determine sex. For the most part, this procedure is seen as stressful for the bird, and produces inaccurate results. The U of A research team was approached by a turkey breeding company with a unique strain of birds. That company has identified a line in which the hens actually begin feathering much later than the toms and therefore can be easily separated without the stress or hit-and-miss aspect of using air. "The largest challenge in using this slow-feathering trait is keeping up production. We are trying to improve the reproductive and growth characteristics of these lines while maintaining the feather trait," explains Korver.

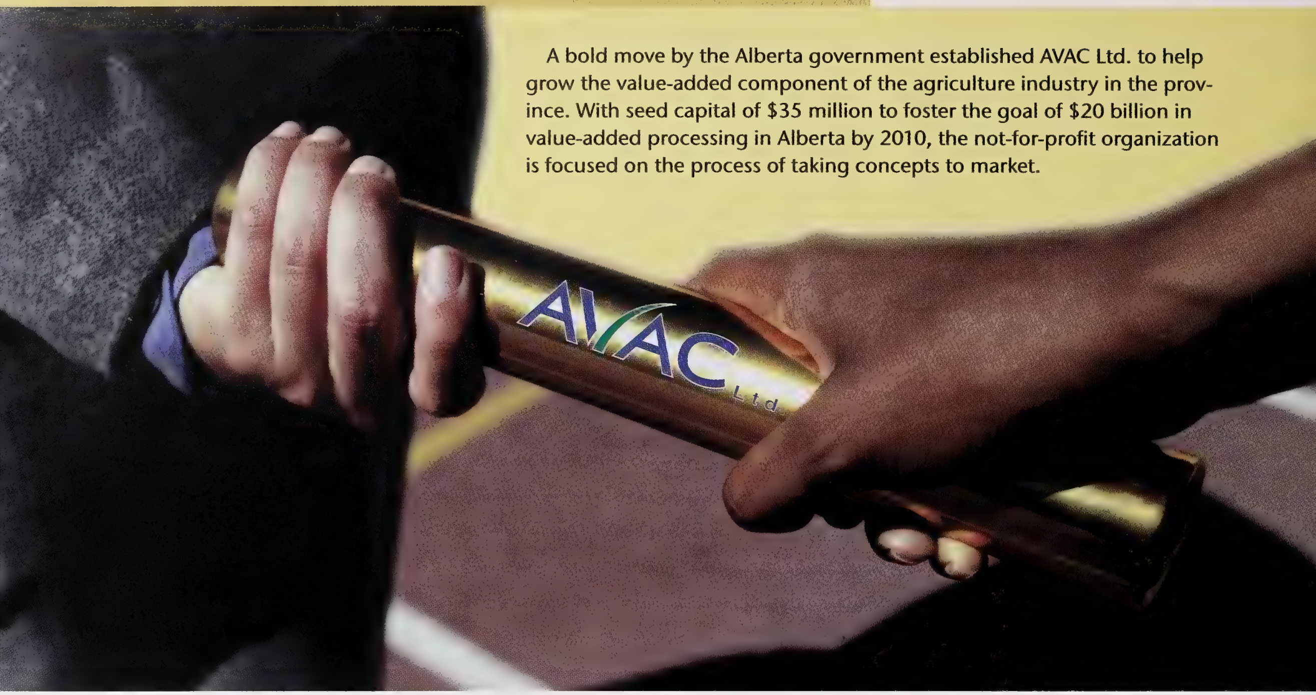
Breeding Better Broilers

By far, the most intensive project focuses on broiler breeding and involves the University of Alberta, two commercial broiler breeding companies, local hatcheries, and the Poultry Industry Council. This broiler project also manipulates photoperiod, but this time the objective is to speed up puberty, not delay it. The project spans 54 weeks of constant measurements and accumulating weekly data of birds on various growth curves. "We have many hands working to accomplish the tedious job of accumulating data," Korver says.

Korver explains many breeding programs are so focused on specific traits that, at times, related traits suffer. The correlation between certain characteristics and other traits is sometimes unexpected resulting in metabolic diseases, like osteoporosis, or decreased production. That in turn can lead to welfare concerns, and the research team at the U of A is confident that their projects, with AARI's help, address both stumbling blocks on the road to efficient production.

"Our research has always been committed to focusing on technology transfer, and answering the 'So what?' question with our projects for every level of production from the breeder companies to the producer," concludes Korver. It's all about keeping ahead of the curve with concrete answers to complex issues.

Making It Meaningful



A bold move by the Alberta government established AVAC Ltd. to help grow the value-added component of the agriculture industry in the province. With seed capital of $35 million to foster the goal of $20 billion in value-added processing in Alberta by 2010, the not-for-profit organization is focused on the process of taking concepts to market.

Keith Jones, President and CEO of AVAC, defines true "value-added" as the product having a uniqueness that makes it worth more to the consumer. Jones cites the example of CV Technologies Inc. (CVT), a group at the University of Alberta who created what they thought was a reliable way to measure how much bioactivity exists in products, but needed clinical trials to validate their findings. AVAC invested $500,000, which was matched with funds from other sources. Based on the success of the trials, the group has launched Cold-FX, a derivative of ginseng, and is now in discussion with potential partners to get the product to the next stage (see story on page 13 for more on Cold-FX).

This is what technology transfer is all about – bringing products to the market. The work in a lab is just the start. The resulting research must be successfully commercialized or shared to provide broad economic benefit. Taking something from the conceptual level to the store shelves needs just as much attention as the research itself.

Jones says technology transfer is hard to do because of the perception that agriculture is historic, with few new ideas or opportunities. This makes it difficult to find investors, and to attract the best and brightest young minds to innovative aspects of the industry, such as the life sciences. Yet examples like CVT are encouraging since the technology is applicable to a wide range of compounds and could play a significant role in helping achieve Alberta's agri-value goal.

Ward Toma of the Alberta Canola Producers Commission agrees that there is a need for technology transfer in Alberta and says that industry has a role to play in closing the gap between researchers and crop consultants to help ensure information is shared. Growers are constant learners, according to Toma, and for this reason the Commission funds projects designed to help them.

Nonetheless, Toma finds the poor information flow frustrating. He calls the last crop year a disaster and considers it to have been worse than necessary. Growing conditions were less than ideal because of the drought, and late rains compounded the problem by causing some seed to germinate later. By harvest time, the crop was actually at two, and in some cases three, different stages of maturity. Toma says that some growers gambled on waiting, hoping a later harvest would capture more of the crop. In fact, that did not happen, and losses were heavier than they might have been had better information been available.

"Experts in canola production would have known that delaying harvest was not a good decision," Toma maintains. "There was no way that crop was ever going to make seed, and growers should have been advised to swath it at the first opportunity and get what they could." But there was no channel to get the information to crop advisors and farmers. "Information flow is the job of tech transfer," he says. "The knowledge is no good sitting on a shelf."

AVAC and other groups including AARI and other members of the Funding Consortium are addressing these concerns through the different services and programs they offer. For example, AVAC also invests in opportunities that build competencies in coaching and allow for the exchange of knowledge and networking. The Funding Consortium's newly created joint Development Application is another attempt to build some of the bridges in the funding continuum. (see story on page one for further info)

It is all about making research meaningful, and Alberta is a leader in creating systems to increase the relevancy of research initiatives to the industries they serve. The better the systems are and the faster they are created, the more opportunity there is to avert problems and foster new opportunities.

On the Way to Market

Taking agricultural research from its earliest stages all the way to success in the commercial marketplace isn't easy, nor is it a common occurrence, but CV Technologies Inc. is doing just that. Their flagship product, Cold-FX, is a nutraceutical that has been shown to prevent, as well as treat, cold and flu symptoms in humans, and is currently poised to take both the agriculture and health industries by storm.

Dr. Jackie Shan

A unique, patented concentrate of immuno-boosting compounds extracted from North American ginseng, Cold-FX is a natural product that works to strengthen your immune system through activating the Natural Killer cell, macrophages, and cytokine production. It is part of the product line belonging to CV Technologies Inc., an Edmonton-based international science company that develops and markets patentable natural health products. Research on the product has been conducted for the last ten years, and though Cold-FX has been available to consumers for a few years now, current research and marketing strategies are sure to carry it to a new level of success.

Dr. Jackie Shan, President and Chief Scientific Officer at CV Technologies, has been part of the Cold-FX project from the very beginning. "When we started, we knew North American ginseng had a lot of value from a pharmacological point of view." From that concept level, CV Technologies designed a formulation, and through their unique process technology, were able to create a high-potency immune-stimulating product.

Part of the commercialization process of Cold-FX has meant having the clinical trials to back up the product. But this, of course, could not be done without major funding. AVAC Ltd., an investment company that focuses on value-added opportunities in the agriculture industry, has provided major support to the project. "Our main objective was to assist CV Technologies with their U.S. FDA (Food and Drug Administration) phase II clinical trials to prove the efficacy of Cold-FX for mitigating cold and flu symptoms," says Ross Bricker, Senior Investment Manager for AVAC.

The results of the trials were positive, showing that there are benefits to using Cold-FX as a preventative measure or treatment of cold and flu. The product can now be backed by sound science. Since it has gone through vigorous quality tests, CV Technologies was able to apply for and be granted an Investigational New Drug (IND) number by the U.S. FDA to proceed with formal phase II clinical trials. **Remarkably, Cold-FX is the first herbal remedy in the world that has successfully completed the trials.** Meanwhile, Health Canada also granted a Drug Identification Number (DIN) to Cold-FX, allowing the claim for treating cold symptoms.

Successful commercialization of Cold-FX is likely to have a positive impact on several key sectors, particularly on agriculture and farming. "We buy a large amount of North American ginseng, all grown in Canada," says Shan. "Plus we do all the processing here in Canada and hire different organizations to do the extractions."

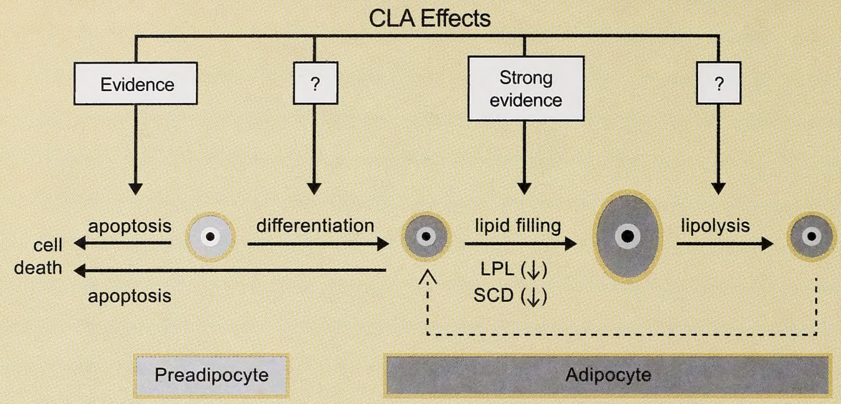
In addition, North American ginseng has the potential to be a profitable cash crop. "Echinacea is currently providing a nice cash income to many small agricultural producers," says Shan, "and North American ginseng could do the same if we encourage the agronomy techniques associated with its propagation." She adds that the public needs to be made more aware of the growth in prospects for medicinal plants and how specialty farming can play a key role.

That role can make a real difference in people's lives and the economy. "The burden of the cold and flu is substantial. We've talked to many medical professionals who say the cost of the cold and flu to the United States is approximately $80 billion annually," notes Shan. Though Canada loses only a fraction of this amount, a product that boasts an 89 per cent reduction in cold and flu incidents which Cold-FX does, is good news for everyone.

Some of the scale-up work of this project was funded by the Agriculture and Food Council under the CARD Funding Program. "It is exciting to see that this research has been picked up and moved along toward a commercial product and onto the shelf through the Agriculture and Food Council and AVAC Ltd.," says Freda Molenkamp of AARI. AARI has been supporting projects in the area of herbal medicine and exploring new specialty crop possibilities since 1996, and sees the value of carrying research right through to the marketplace.

There's a fair distance between agricultural research and the marketplace, but when the two connect, the outcome is positive. CV Technologies' product, Cold-FX, is a prime example of such a successful connection.

Strength in Numbers



Working in collaboration – that is the impetus behind the conjugated linoleic acid (CLA) network project. Largely funded by AARI and other members of the Agricultural Funding Consortium, the program joins together researchers, industry players, and government participants in understanding the role CLA plays in human health, and the impact it may have on the beef and dairy industries.

Conjugated Linoleic Acid (CLA) has garnered a lot of attention in the recent past. And why shouldn't it? Research has shown that CLA – a substance found in the rumen, or first stomach, of animals such as cattle, sheep, and goats – has positive health effects in mice and rats. The effects include controlling obesity, diabetes, and even shrinking cancer tumours. It is hoped that these same effects might also be found for humans who ingest CLA since these are also some of the biggest issues in human health.

CLA Project Goals

To improve the image of products containing animal fat, and increase the demand for meat, dairy products, and animal-based nutraceuticals by:

- **Developing a production and processing system that will yield new meat, milk, or nutraceutical products with a biologically significant and consistent amount of natural CLA**
- **Clearly defining human health benefits of CLA**

And there has been no lack of research in mice and rats; scientists from all over the world have been looking into the properties and effects of CLA since the 1970s and seem to have renewed their interests in CLA in the last few years. We know that there is a connection between some components of animal fat and human health, and CLA is one such component. Special attention has been placed on CLA content in bovines, as there is potential for humans to receive the substance by ingesting CLA-enriched beef or dairy products.

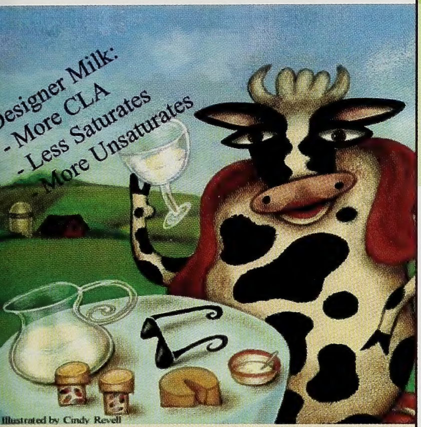
In the Fall of 2001, the Agricultural Funding Consortium received seven different CLA proposals and, rather than picking one or two, asked the researchers to join these together and bring back an integrated proposal for CLA work. The result was the eventual development of the CLA Network and science plan. "Asking the researchers to come together with industry and build a solid science plan for CLA was a major step forward," says Alan Hall, Acting Director for AARI. Dr. Heather Loeppky, the CLA Team's Project Coordinator agrees: "We started up the project because we saw a number of people working on different aspects of CLA around Alberta and the country, but who were not fully collaborating with each other. We saw an opportunity to bring the pieces together."

With almost $2 million in funding from three key groups (AARI and other Funding Consortium partners, including Alberta Livestock Industry Development Fund, and Agriculture and Food Council), not to mention support from the beef and dairy industries, the project allows for the strength and efficiency that comes from a collaboration of minds and money.

The CLA Project Team includes about 27 researchers from around the world (the majority of whom work in Alberta) and several other government and industry participants. Loeppky explains that by including people from every aspect of CLA research and product development, it can be taken "from science to supper." "The network is working from basic health science right through to developing production systems and products that meet health needs," says Loeppky.

Dr. Erasmus Okine of the University of Alberta is the overall scientific leader of the network's research and head of the animal mechanistic portion of the project. "As a group, we are looking at the production of CLA-enriched meat and milk products, the understanding of mechanisms by which CLA works in animals, understanding the health implications of CLA-enriched meat and milk products on humans, and the acceptance of these products by the general public." Okine explains that to do this the work has been divided into modules on beef, dairy, human health, animal mechanisms, and product development and marketing. "The modules are in various stages of progress. The dairy module is the most advanced in terms of research, while other modules are slated to start later this year," notes Okine.

Industry partners that are interested in commercializing the work once it has been completed are currently involved in market research and looking at consumer trends and needs. Brad McNish, President of Sepallo, is part of the Product Development and Market Research module of the network. Based in Kelowna, British Columbia, Sepallo is a manufacturer of predominantly fruit and vegetable products for the food and health industry. "We are interested in taking the technology that comes out of this project as it is developed and creating a commercial product that can be taken into the marketplace," says McNish. "We are focusing exclusively on developing dairy products that have a quantifiably high and efficacious level of CLA."



Illustrated by Cindy Revell

Part of Sepallo's marketing strategy is to understand the public's perception of what a healthy diet looks like so they can find an effective vehicle through which to take a product to the market. "We need to make consumers aware that not all fats are equal, that there are some healthy fats, and that they occur in dairy and beef products," says Loeppky.

> "The network is working from basic health science right through to developing production systems and products that meet health needs."
>
> Dr. Heather Loeppky
> Project Coordinator, CLA Team

Cindy Thorvaldson, the Network Chair of the CLA project, also sees the need to look at the consumer perspective. "Consumers are choosing low-fat dairy products in hopes of improving their health. Ironically, the very components they are eliminating contain many healthful properties." Making consumers aware of this will involve educating them on the health benefits of CLA.

The network project has the potential to impact hugely on human health, the industries that serve it, and consequently some important sectors of animal agriculture. Much work in all areas of the project has yet to be done, but the framework is strongly in place. Collaborations need to continue both nationally and internationally, as this is a rapidly growing area of interest around the world.

Responsive Research

Near-market research is driven by the swine industry's needs. In today's world, that means honing in on the issues under public scrutiny that affect the long-term viability of the hog business, such as air quality, odour, and swine housing. The U of A, AAFRD, and the Prairie Swine Centre are working on projects relating to these issues.

Addressing public criticism of the swine industry is essential to ensuring its growth and sustainability. The University of Alberta (U of A), Alberta Agriculture, Food and Rural Development (AAFRD), and the Prairie Swine Centre (PSC) pride themselves on undertaking research driven by this need, and are currently involved in several different projects related to helping the hog industry.

A Breath of Fresh Air

Swine barn odour is one concern that is high on the list of public concerns, and researchers at the U of A are heavily involved in studying the issue. They are working toward figuring out how to quantify smell in the area surrounding a swine facility with confidence and consistency. "Currently, there is no set measure of odour for comparison," explains Dr. John Feddes of the U of A. "Part of our project seeks to set up a 'confidence' protocol to measure just how strong an odour is, as smell tends to be subjective." Feddes is sampling odour emissions from earthen manure storage facilities, liquid storage tanks, and barn ventilation systems to try and put a number on smell.

Closely related to Feddes' work is a PSC project focused on understanding how other air contaminants, like dust, hydrogen sulfide, and ammonia, are produced, and what their relative importance is within the swine facility.

After exploring the dynamics of air contaminants, the goal of the PSC project is to evaluate control procedures of these air contaminants in a dynamic system. "We're manipulating such variants as diet, design of slats and pens, and pit additives to find which combination produces the healthiest respiratory environment for swine and the humans working with them," explains Dr. John Patience, President and CEO of PSC, located in Saskatoon.

Eliminating Odour

Once work is done to understand and measure odour, researchers can look at getting rid of it. Ike Edeogu, with AAFRD, is looking forward to Feddes working out a smelly-scale, because his odour reduction study can then progress more quickly, hopefully by this summer. "We have five manure odour-controlling technologies to evaluate: biofiltration, oil sprinkling, composting, using additives during composting, and diet manipulation," explains Edeogu. Dr. Feddes' measurement procedures are necessary to evaluate the effectiveness of these technologies.

PSC is seeking to eliminate manure odour from the front end by using diet manipulation to move nitrogen into the fecal portion of waste, as opposed to being excreted as pungent ammonia in urine. "The results we have so far, especially by using fermentable carbohydrates, are positive. It is promising," says Patience.

Let Freedom Reign?

Gestating sow housing is a current hot topic with animal rights groups, as there is concern that a confined sow may be treated inhumanely. Dr. Harold Gonyou is researching all aspects of group housing for gestating sows at the new PSC research facility at Elstow, Saskatchewan. The project is looking at both static and dynamic systems for group housing, a possible new trend in the swine industry. A static system keeps the same group of sows together in a single pen from breeding to farrowing, and a dynamic system involves adding or removing sows throughout the cycle. The studies include evaluation of reproductive performance as well as behaviour dynamics to provide Prairie producers with as much information as possible when making decisions about design and management of their operation.

Farm management and the success of the swine industry are two highly significant issues, which is why research in these areas has been supported by several key funders. According to Patience, funding comes in from all three Prairie province producer groups and is multiplied by public organizations such as AARI. Researchers at the U of A and AAFRD also credit AARI, along with the Alberta Livestock Industry Development Fund, for making their swine research possible.

A Framework for Su

National Library of Canada
Bibliothèque nationale du Canada
3 3286 52778945 3

Alan Hall, Acting Managing Director of AARI, talks about the government's commitment to agriculture research through their latest initiative, and why he has high hopes for Alberta agriculture.

What an exciting time it is to be a part of Alberta agriculture. Never before has research been more innovative or more important to our province. New research opportunities in all areas of agriculture are being brought forward continuously, bringing with them growth to Alberta's economy in so many different ways. And making the situation even better is the government's latest initiative for agriculture – Alberta's Agricultural Research and Innovation Strategic Framework.

A well-organized and powerful research system will create new opportunities for Alberta businesses, including more jobs in rural areas and new value-added products, to attract major national and international businesses to Alberta, and to attract and retain the skilled workforce needed to maintain and grow research and innovation. These tasks are by no means small; they are important and complex. The Strategic Framework, however, is set-up to accomplish them. Key to the success will be ensuring R&D efforts are closely aligned with market opportunities and business. As critical will be ensuring R&D is also focused on public good such as food safety, sustainability, and generating new knowledge important to the future competition of our economy.

In 2001, AARI and Alberta Agriculture, Food and Rural Development (AAFRD) led a review of Alberta's research and innovation effectiveness. They found that:

- research and innovation needed to be better aligned with growth opportunities,
- research funding and performing organizations needed to be more collaborative,
- gaps in research and innovation capacity needed to be filled, and
- public/private sector partnerships needed to be improved and expanded upon.

With these considerations in mind, the Framework was developed by a stakeholder working group made up of participants from industry, research organizations, funders, and government. Several broadly-based stakeholder consultations were held as part of this process. It involves a five-year research strategy that will undoubtedly strengthen and grow Alberta's current research and economic position, not to mention make it more efficient. In fact, there is incredible opportunity for the Framework to contribute greatly to the agriculture industry's potential goal of reaching $20 billion in value-added production and $10 billion in primary production by the year 2010.

Goals of the strategy include:

- Recruitment and training of more than 300 new, highly-qualified personnel for Alberta's life sciences research and innovation system.
- Creation of 125 products/technologies and 70 new companies using intellectual property generated by the new research and innovation system.
- Attracting $272 million in private investment to commercialize technologies and products created and enabled by the research and innovation system.
- Attracting $234.5 million in federal and international funding to build on the province's capacity in science and innovation.
- Attracting and establishing nationally and internationally recognized scientific leaders in priority life sciences areas.

There are indeed significant and exciting challenges. Talking the talk is easy; walking the walk will require strong leadership, a collective willingness to work together much more collaboratively, and successful strengthening of the partnership between private and public sectors and among various stakeholder organizations, companies, funding groups, and research agencies. Creating a critical mass of public/private expertise and capacity in strategic areas most important to the future growth of our industry is essential. Partnering with other sectors of our economy, eg. forestry, health, environment, energy, information technology, etc. must be done. Linking Alberta efforts with the efforts of others across Canada and around the world will also prove to be critical.

There are several aspects of the Framework that I believe will contribute to its success. Perhaps one of its strongest is its commitment to joining research with the marketplace, an aspiration essential to further growth in Alberta agriculture. Gwyn Morgan, as quoted in Time's November 2002 issue, suggests two limitations to our future progress: "...action without knowledge...knowledge without action." To me, "This encompasses the impetus behind the Strategic Framework; without research we diminish our success in the marketplace, and without the marketplace, research is futile. We will be creating new products, processes and technologies to sell, and taking knowledge from research and making it accessible to those who may be able to benefit from it."

The common strategic focus of the Framework is yet another strength of the project. It will allow for collaboration among industry participants, researchers, funders, and government that will create efficiency and economic growth. More minds and more funds mean more ideas can get through the pipeline and out on the market. The possibilities are endless.

AARI looks forward to the challenge of leading the implementation of the Framework. Working together, "the total will far exceed the sum of the parts."

Alan Hall
Acting Managing Director, AARI

FOR INFO:

Alberta Agricultural Research Institute
9th Floor North, John E. Brownlee Building
10365-97 Street, Edmonton, AB T5J 3W7
Tel: 780.427.1956 | Fax: 780.427.3252 | www.aari.ab.ca

The Link is a quarterly newsletter published by the Alberta Agricultural Research Institute (AARI) that communicates with Alberta's agriculture and research communities.

AARI is an institute established by the *Alberta Science and Research Authority Act.*

Submissions and feedback are welcome.

Alberta INNOVATION AND SCIENCE
ASRA Alberta Science a
Research Autho